TM 11-6625-362-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S AND ORGANIZATIONAL
MAINTENANCE MANUAL

TEST SET, RELAY TS-1194A/U

HEADQUARTERS, DEPARTMENT OF THE ARMY
6 SEPTEMBER 1960

WARNING

DANGEROUS VOLTAGES EXIST IN THIS TEST SET

Be careful when working on the 75-volt dc power supply circuit, or on the 115-volt ac line connections.

DON'T TAKE CHANCES!

TECHNICAL MANUAL
No. 11–6625–362–12

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *6 September 1960*

TEST SET, RELAY TS–1194A/U

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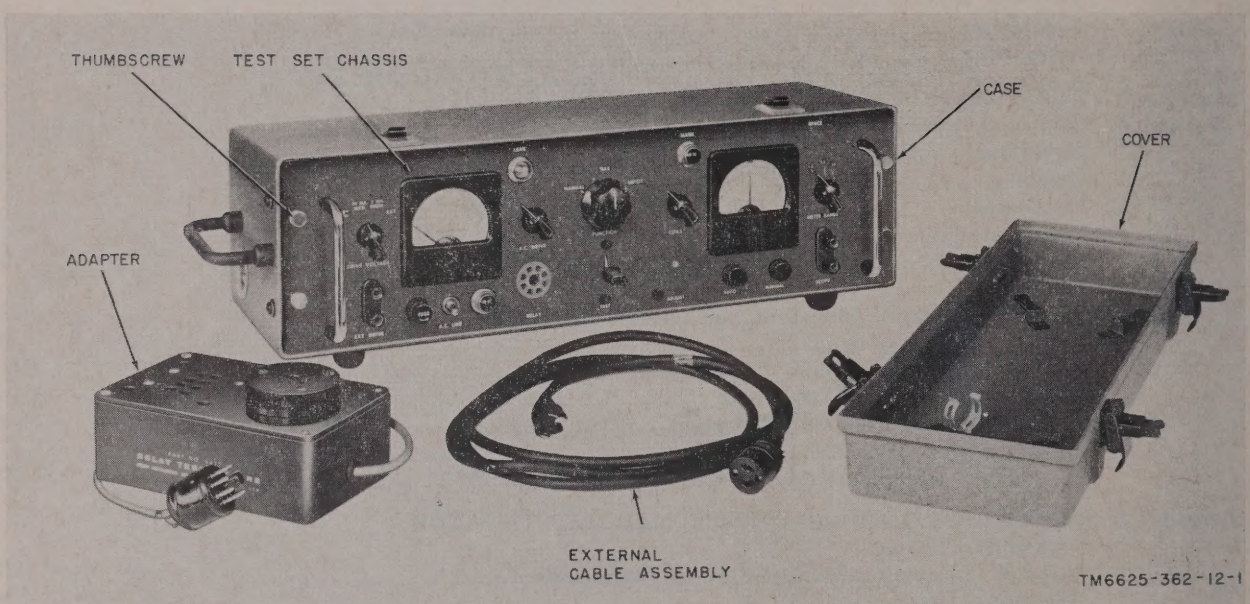

Figure 1. Test Set, Relay TS–1194A/U, less running spares.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

This technical manual describes Test Set, Relay TS–1194A/U (fig. 1) and covers its installation, operation, and organizational maintenance. It includes cleaning and inspection and replacement of parts available to first and second echelon maintenance personnel. Throughout this manual, Test Set, Relay TS–1194A/U is referred to as the test set.

2. Forms and Records

a. Unsatisfactory Equipment Report. Fill out and forward DA Form 468 (Unsatisfactory Equipment Report), to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: SIGMS-MLM, Fort Monmouth, N. J., as prescribed in AR 700–38.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58.

c. Preventive Maintenance Forms. Prepare DA Form 11-266 (fig. 9 and 10) (Maintenance Check List for Signal Equipment (Test Equipment)), in accordance with instructions on the form.

d. Parts List Form. Forward DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manuals 7, 8, and 9) directly to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: SIGMS-MLM, Fort Monmouth, N. J., with comments on parts listings in appendix II.

e. Comments on Manual. Forward all other comments on this publication directly to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: Pub Engrg Dept, Fort Monmouth, N. J.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Test Set, Relay TS–1194A/U (fig. 1) is capable of making the following tests of polar relays:

(1) Sensitivity (operate current).
(2) Contact circuit bias (percent).
(3) Contact circuit total break (transfer) time (percent).
(4) Insulation resistance (between relay coils and contact circuits).

b. The test set can be used to test the following relays:

(1) Sigma type 72Z (series TS and TG) with 10–, 160–, 400–, 1,000–, 2,500–, or 4,000–ohm coils.
(2) Sigma type 7Z (series T) with 150–, 1,000–, or 3,100–ohm coils.
(3) Sigma type 72Y (series BD) with 160–, 400–, 1,000–, 2,500–, or 4,000–ohm coils.
(4) Sigma type 7Y (series B) with 250–, 1,000–, or 5,000–ohm coils.
(5) Relay RE-163/G (Western Electric type 255A).

c. The test set can be retained in its case and used as a portable test set, or it can be removed from the case and mounted in a standard 19-inch rack.

4. Technical Characteristics

Line-voltage input ..... 110 to 124, 50 to 70 cps, single phase.
Power consumption ..... 30 at 117.

Meter ranges:
Sensitivity (operate current) test ..... 0-1 ma, 0-2.5 ma, 0-10 ma.
Bias test ..... 0-25 percent marking, 0-25 percent spacing.

Break test (total transfer time) 0-25 percent of time required for one input cycle (marking and spacing impulses).

Insulation resistance test ..... Lamp lights to indicate less than 1 megohm between relay coil and relay contact circuits.

Weight:
Unpacked ..... 15 lb.
Packed for shipment.. 24 lb.

5. Components

a. Test Set, Relay TS–1194A/U (fig. 1).

Quantity	Item	Height (in.)	Depth (in.)	Width (in.)	Unit weight (lb)
1	Test set, chassis	5¼	3¼	19	7
1	Case	5⅝	6½	19⅜	5
1	Cover	2	5¾	19⅝	1
1	Cable assembly, external				
1	Adapter	2⅝	3¾	6¼	2
2	Technical manual, TM 11–6625–362–12				
1 set	Running spares (*b* below)				

b. Running Spares (fig. 2).

Quantity	Item
1	Electron tube, 6X4 (V2).
1	Electron tube, OA3/VR75 (V1).
6	Fuse, 1 amp, 125-v (Fl).
1	Lamp, glow, OS2 (DS2).
2	Lamp, incandescent, 6.3-v (DS1, DS3, DS4).

6. Description

The main components of Test Set, Relay TS–1194A/U are shown in figure 1. The running spares are shown in figure 2.

a. The case assembly (fig. 3) includes the case and cover which are made of molded fiberglass. The case assembly houses all components of the test set except the adapter and the spare parts.

b. The test set includes a two-tube power supply which converts the alternating current (ac) input to 75 volts direct current (dc) for the dc test circuits.

c. All operating controls are located on the front panel.

d. An internal cable assembly (fig. 3) is used to transfer power from one end of the external cable assembly (fig. 1) to a receptacle (not shown) on the rear of the test set chassis when the test set is used while mounted in its case.

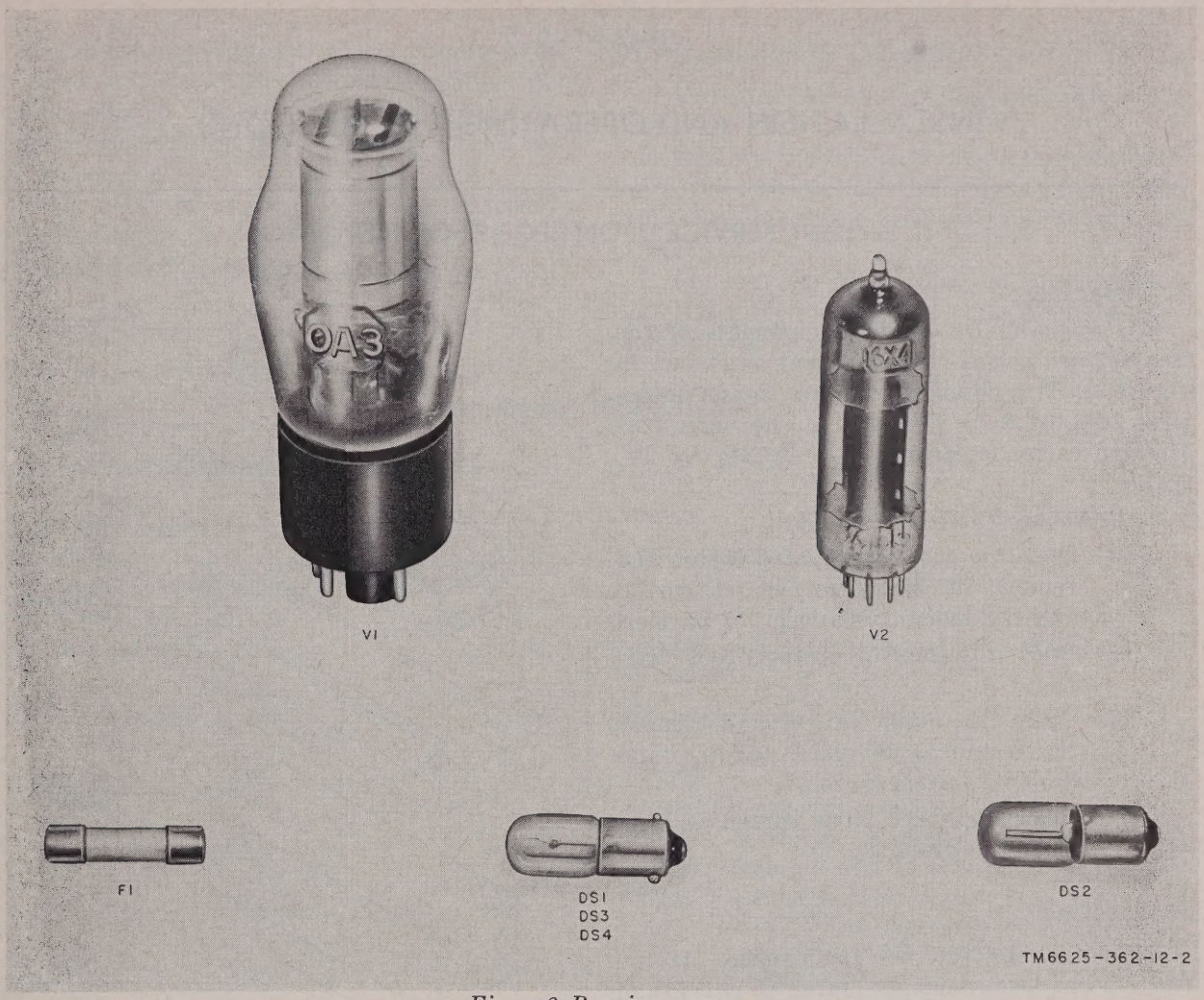

Figure 2. Running spares.

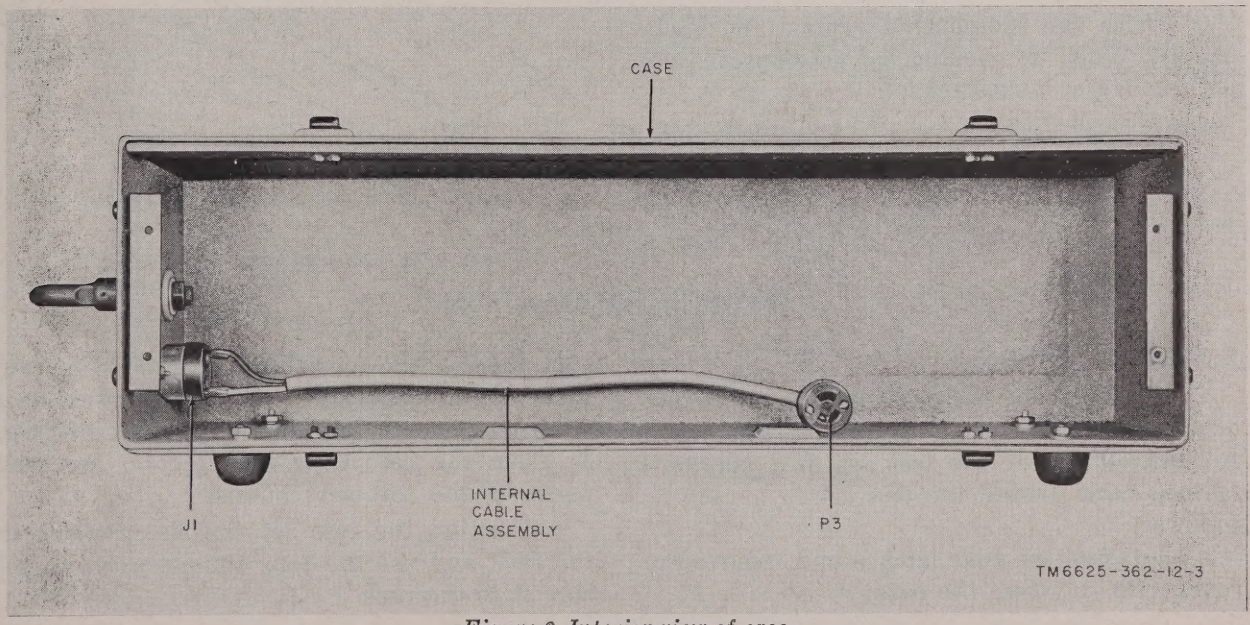

Figure 3. Interior view of case.

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF TEST SET

7. Unpacking

a. Packaging Data. The components of the test set are packed for shipment as shown in figure 4. The outer corrugated carton measures 26¼ by 9 by 7¾ inches. The inner corrugated carton measures 25½ by 8¼ by 6¾ inches.

b. Removing Contents (fig. 4).

(1) Open the outer corrugated carton and remove the inner corrugated carton and the moisture-vaporproof barrier.

(2) Open the moisture-vaporproof barrier.

(3) Open the inner carton and remove the technical manuals, adapter, and the spare parts carton.

(4) Open the spare parts carton and remove the contents.

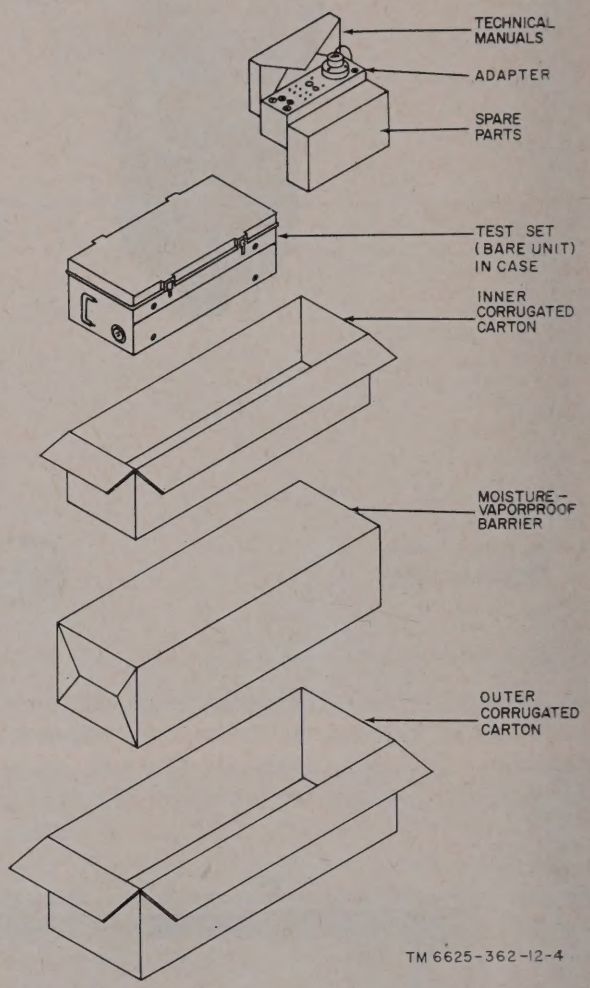

Figure 4. Test set packaging arrangement.

8. Checking

a. Inspect the test set for damage. If the test set has been damaged, refer to paragraph 2*b*.

b. Check the components against the packing list. When no packing list accompanies the test set, refer to paragraph 5.

Section II. INSTALLATION

9. Rack Installation

A vertical space of 5 inches and a minimum depth of 7 inches (front to back) are required for installation of the test set in a standard 19-inch rack. Install the test set in a rack as follows:

a. Unfasten the four latches and remove the cover (fig. 1) from the case.

b. Remove the four thumbscrews (two from each side of front panel), lift the test set chassis from the case, and disconnect plug P3 (fig. 3) from the receptacle mounted on the rear panel of the test set chassis.

c. Position the test set chassis in place in the rack and use the four thumbscrews to secure it to the rack.

d. Remove the external cable assembly (fig. 1) from the clips in the cover and connect the female plug of the cable assembly to the receptacle mounted on the rear panel of the test set chassis.

e. Connect the male plug of the external-cable assembly to a 110-124-volt, 50-70-cycles per second (cps), single-phase power source.

10. Preparation for Use as Portable Test Set

a. Unfasten the four latches and remove the cover (fig. 1).

b. Remove the external cable assembly from the cover and connect the female plug of the cable assembly to the receptacle on the left side of the case.

c. Connect the male plug of the external cable assembly to a 110-124-v, 50-70-cps, single-phase power source.

Section III. OPERATION

11. Operator's Controls, Indicators, and Terminals
(fig. 5)

Control, indicator, or terminal	Function
A.C. LINE switch	Controls ac input to test set (lower position-on; upper position-off).
FUNCTION switch	Selects test to be applied to relay:
	Position — *Test* MANUAL — Sensitivity (manual). AUTO — Sensitivity (automatic). BIAS — Bias in contact circuits. BREAK — Total time armature is in transit from mark to space contacts and from space to mark contacts *during one full input signal cycle.* HIPOT — Insulation resistance.
DRIVE VOLTAGE switch	In LOW, MED., and HIGH positions, selects drive voltage to be applied to relay and selects scale of A.C. MILLIAMPERES meter (50 ma in LOW and MED.; 5 ma in HIGH). In EXT position, connects coils of relay to EXT. DRIVE terminals.
EXT. DRIVE terminals	Connection points for external source of 2c for relay coils when frequency other than 50-70 cps is desired for bias and break tests.
A.C. DRIVE knob	Adjusts amount of drive current through coils of relay under test.
A.C. MILLIAMPERES meter	Measures ac drive current applied to relay (except when DRIVE VOLTAGE switch is at EXT).
SCOPE terminals	Connection points for oscilloscope (para 22–24).

Control, indicator, or terminal	Function
COILS switch	Selects relay coil (or winding) to be used for test: *Position* — *Coil or winding* 3–2 — 3–2 coil in Sigma type 7 and 72; 7–2 winding in WECo type 255A. 1–8 — 1–8 coil in Sigma type 7 and 72; 3–6 winding in WECo type 255A. BOTH — Both coils (or windings), connected in series.
METER RANGE switch	Selects range of D.C. MILLIAMPERES meter (1-0-1 ma; 2.5-0-2.5 ma; or 10-0-10 ma).
MANUAL knob	Adjusts amount of drive current applied to relay during manual sensitivity test.
D.C. MILLAMPERES meter	Measures dc drive current applied to relay under test. Also indicates contact circuit bias (FUNCTION switch in BIAS position) and total contact transfer time (FUNCTION switch in BREAK position).
AUTO knob	Adjusts frequency of coil energization during sensitivity test when FUNCTION switch is in AUTO position.
TEST switch	When depressed, applies various tests to relay depending on FUNCTION switch setting. Automatically returns to original position.
ADJUST control	Used for preliminary adjustment of D.C. MILLIAMPERES meter for BIAS and BREAK tests.
MARK indicator (green)	Indicates closure of circuit between armature and mark contact of relay under test.
SPACE indicator (amber)	Indicates closure of circuit between armature and space contact of relay under test.
LEAK indicator (white)	Indicates insulation leakage between coils and contact circuit of relay under test.
Pilot indicator (red)	Indicates ac power is applied to test set circuits.

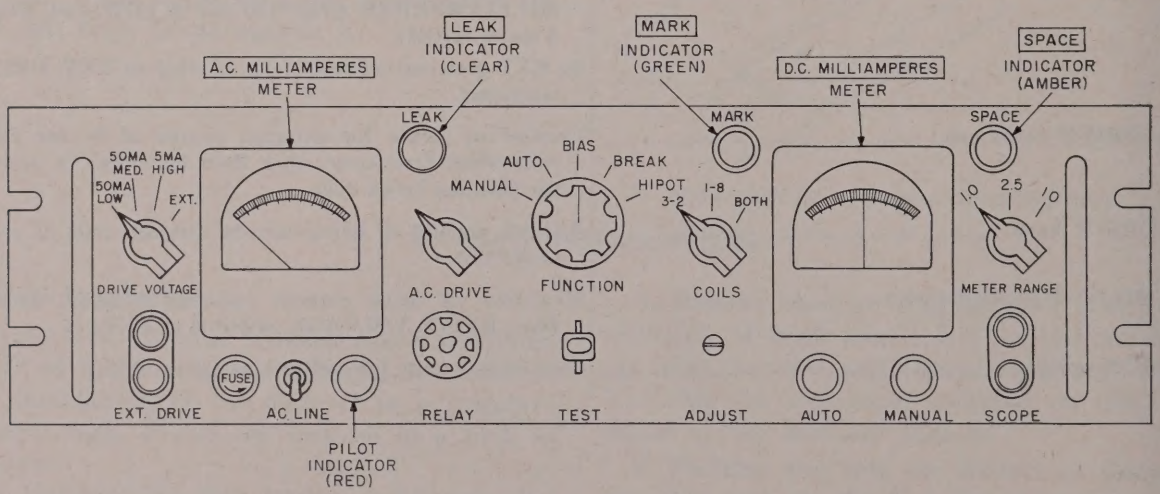

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Figure 5. Test set operating controls.

12. Starting and Stopping

a. Starting. Set the A.C. LINE switch (fig. 5) to the lower (on) position to place the test set in operation. The pilot indicator (red) should light.

Note. The position of all controls and switches (except A.C. LINE switch) is immaterial when applying power to the test set. The D.C. MILLIAMPERES meter will deflect off scale when the FUNCTION switch is in the BREAK position and when there is no relay in the RELAY receptacle. The D.C. MILLIAMPERES meter will also deflect off scale when the FUNCTION switch is in the BIAS position while an insufficient amount of current is applied to the relay being tested. Neither of these conditions will harm the meter.

b. Stopping. Set the A.C. LINE switch to the upper (off) position to disconnect power from the circuits of the test set.

13. Testing Sigma Type 7Z and 72Z Relays

Sigma type 7Z and 72Z relays are magnetic-latching relays. (No mechanical bias is present and the armature rests against *either* the marking or spacing contact when neither coil of the relay is energized.) Apply power to the test set (para 12) and test these relays as described below. Complete testing of Sigma type 7Z and 72Z relays includes the bias test, sensitivity tests, break test, and insulation resistance test (*a* through *e* below). If waveform indications of the relay output signals are desired during the bias and break tests, use an oscilloscope as described in paragraphs 22 through 24.

a. Bias Test. Use this test procedure to check for bias in the output (contact circuits) of Sigma type 7Z and 72Z relays. If the test indicates the presence of bias, adjust the Sigma type 72Z relay as described in paragraph 14.

(1) Set the controls as follows:

Note. The position of all controls not referenced in the following instructions is immaterial.

Control	Setting
FUNCTION switch	BIAS.
COILS switch	Either 3–2 or 1–8.
A.C. DRIVE knob	Fully counterclockwise.
DRIVE VOLTAGE switch	See table I below.

TABLE I. BIAS AND BREAK TEST TABLE (SIGMA TYPE 7Z AND 72Z RELAYS)

Sigma relay type No.	DRIVE VOLTAGE Switch position	A.C. MILLIAMPERES meter scale	Ac drive current (ma)
72Z–10TS	LOW	50	30
72Z–10TG	LOW	50	20
72Z–160TS	LOW	50	15
72Z–160TG	LOW	50	10
72Z–400TS	MED.	50	10
72Z–400TG	MED.	50	6.5
72Z–1000TS	MED.	50	6
72Z–1000TG	MED.	50	4
72Z–4000TS	HIGH	5	3
72Z–4000TG	HIGH	5	2
72Z–2500TS	HIGH	5	3.8
72Z–2500TG	HIGH	5	2.5
7Z–150T	LOW	50	20
7Z–1000T	MED.	50	8
7Z–3100T	HIGH	5	4

(2) Plug the relay to be tested into the RELAY receptacle.

(3) Turn the A. C. DRIVE knob until the A. C. MILLIAMPERES meter indicates approximately the current value listed in the *Ac drive current* column of table I above.

(4) Hold the TEST switch in the downward position. The pointer of the D. C. MILLIAMPERES meter should move to either the left or right full-scale position. If it does not deflect full scale, turn the ADJUST control clockwise until the full-scale position is reached. If full-scale deflection is not possible, set the ADJUST control to obtain a reading within one division of full-scale deflection.

(5) Release the TEST switch and note the position of the D.C. MILLIAMPERES meter pointer. Marking bias is present if the pointer is positioned to the left of center. Spacing bias is present if the pointer is positioned to the right of center. Multiply the meter reading

by ten to determine the percentage of bias. Bias should not exceed two percent.

b. Sensitivity Test (Manual). Use this test procedure to determine the relay operate current (minimum current required to move the armature of the relay from either contact to the opposite contact).

Note. Sigma type 7Z and 72Z relays are magnetic-latching relays (armature rests against either marking or spacing contact when neither coil of the relay is energized).

(1) Set the controls (fig. 5) as follows:

Control	Setting
FUNCTION switch	MANUAL.
MANUAL knob	Fully counterclockwise.
COILS switch	See table II.
METER RANGE switch ..	See table II.

TABLE II. SENSITIVITY TEST TABLE
(SIGMA TYPE 7Z AND 72Z RELAYS)

Sigma relay type No.	COILS switch position	METER RANGE switch position	Operate current (ma)	
			Min	Max
72Z–10TS	3–2 or 1–8	10	2.4	5.6
72Z–10TG	BOTH	10	9.16	14.4
72Z–160TS	3–2 or 1–8	2.5	0.6	1.4
72Z–160TG	3–2 or 1–8	10	0.24	0.36
72Z–400TS	3–2 or 1–8	1.0	0.39	0.91
72Z–400TG	3–2 or 1–8	2.5	1.6	2.4
72Z–1000TS	3–2 or 1–8	1.0	0.24	0.56
72Z–1000TG	3–2 or 1–8	2.5	0.96	1.44
72Z–2500TS	3–2 or 1–8	1.0	0.15	0.35
72Z–2500TG	3–2 or 1–8	1.0	0.6	0.9
72Z–4000TS	3–2 or 1–8	1.0	0.12	0.28
72Z–4000TG	3–2 or 1–8	1.0	0.48	0.72
7Z–150T	3–2 or 1–8	10	.....	2.1
7Z–1000T	3–2 or 1–8	2.5	.....	0.81
7Z–3100T	3–2 or 1–8	1.0	.....	0.5

(2) Plug the relay to be tested into the RELAY receptacle. The MARK indicator should light indicating that the armature is against the marking contact.

(3) Turn the MANUAL knob slowly clockwise and note the current value indicated by the D. C. MILLIAMPERES meter the instant the SPACE indicator lights. This is the current required to move the armature to the spacing contact.

(4) Turn the MANUAL knob slowly counterclockwise and note the current value indicated by the meter the instant the MARK indicator lights. This is the current required to move the armature to the marking contact.

(5) If both current readings are not within the tolerances listed in table II, adjust the Sigma type 72Z relay as described in paragraph 14.

c. Sensitivity Test (Automatic). Use this test procedure to obtain continuous automatic indications of the relay operate current. This test is not as accurate as the manual sensitivity test (*b* above), but it is accurate enough for most applications of the relay. It also permits the operator to use both hands to adjust the sensitivity of the Sigma type 72Z relay while observing the sensitivity in the form of oscillations of the D. C. MILLIAMPERES meter pointer.

Note. The MARK and SPACE indicators do not light during this test.

(1) Set the controls as follows:

Control	Setting
FUNCTION switch	AUTO.
AUTO knob	Fully counterclockwise
METER RANGE switch ..	See table II.
COILS switch	See table II.

(2) Plug the relay to be tested into the RELAY receptacle.

(3) Turn the AUTO knob slowly clockwise until the pointer of the D. C. MILLIAMPERES meter oscillates from side to side at a rate of one or two cycles (round trip) per second. The maximum indication on the left side of the meter indicates the value of current required to move the armature from the spacing contact (relay

pin 4) to the marking contact (relay pin 7). The maximum indication on the right side of the meter indicates mark-to-space operate current value.

(4) If the current indications are not within the permissible tolerances shown in table II, adjust the Sigma type 72Z relay as described in paragraph 14.

d. Break Test. Use this test procedure to determine the sum of the two transfer times of the relay under test (time required for the armature to move from each contact to the opposite contact). This sum is indicated by the test set as a percentage of the total time of one input signal cycle. The break percentage should not exceed ten percent. The contact efficiency (total time armature is against relay contacts during one full input signal cycle) is obtained by subtracting the break percentage from 100. If the break percentage exceeds ten percent, adjust the Sigma type 72Z relay as described in paragraph 14.

(1) Set the controls (fig. 5) as follows:

Control	Setting
FUNCTION switch	BREAK.
COILS switch	3–2 or 1–8.
A. C. DRIVE knob	Fully counterclockwise.
DRIVE VOLTAGE switch	See table I above.

(2) Plug the relay to be tested into the RELAY receptacle.

(3) Turn the A. C. DRIVE knob clockwise until the A. C. MILLIAMPERES meter indicates approximately the applicable current value listed in the *Ac drive current* column in table I.

(4) Hold the TEST switch in the downward position. The pointer of the D. C. MILLIAMPERES meter should move to the right full-scale position. If it does not deflect full scale, turn the ADJUST control to obtain full-scale deflection. If full-scale deflection is not possible, set the ADJUST control to obtain a reading within one division of full-scale deflection.

(5) Release the TEST switch and note the position of the D. C. MILLIAMPERES pointer. Multiply the top-scale indication by 10 to obtain the break percentage.

e. Insulation Resistance Test. Use this test procedure to determine if the resistance between the coils and the contact circuits of the relay is less than 1 megohm. Make the resistance test as follows:

(1) Set the FUNCTION switch to HIPOT.

(2) Plug the relay to be tested into the RELAY receptacle.

(3) If the continuity of either of the relay coils is doubtful, set the COILS switch to BOTH; otherwise the setting of the COILS switch is immaterial.

(4) Move the TEST switch to the downward position. If the insulation resistance is less than 1 megohm, the LEAK indicator will glow continuously.

Note. A momentary flash of the LEAK indicator does not indicate sufficient resistance.

14. Adjusting Sigma Type 72Z Relays

Note. When a Sigma type 72 relay is adjusted for zero bias (*a* and *b* below), it is identified as a Sigma type 72Z relay. If the relay is further adjusted to insert mechanical bias (para 16), it is identified as a Sigma type 72Y relay.

a. Contact and Bias Adjustments.

(1) Remove the cover of the relay.

(2) Set the A. C. LINE switch (fig. 5) to the off (upper) position and plug the relay to be tested into the RELAY receptacle of the test set.

(3) Unscrew both contact screws (C, fig. 6) until the contact end of the armature rests against the right front pole piece (B, fig. 7).

(4) Insert a 1/8-inch wide, 0.004-inch thick paper shim between the armature and the right rear pole piece of the relay (C, fig. 7).

(5) Set the FUNCTION switch to MANUAL, the A. C. LINE switch to the on (lower) position, and adjust the MANUAL knob to cause the armature to press the paper shim against the right rear pole piece. Turn the marking contact screw (D, fig. 7) toward the armature until the MARK indicator lights.

(6) Set the A. C. LINE switch to the off position, remove the paper shim from the right side of the armature, and insert it between the left rear pole piece and the armature.

(7) Set the A. C. LINE switch to the on position and turn the MANUAL knob to cause the armature to press the paper shim against the left rear pole piece. Turn the spacing contact screw toward the armature until the SPACE indicator lights.

Note. Upon completion of steps (1) through (7) above, the contacts are equidistant from a front-to-rear centerline through the pole-piece gaps. However, the contacts are too closely spaced. Make the final contact adjustments as described in (8) through (12) below.

(8) Set the FUNCTION switch to BIAS, and the A. C. LINE switch to the on position. Adjust the bias adjusting screw of the relay (C, fig. 6) to obtain an approximate zero bias condition (D. C. MILLIAMPERES meter indicates approximately zero).

Note. A steel leaf spring provides pressure to keep one end of a crank pressing against the end of the bias adjusting screw. Turning the screw inward pushes the crank in a direction to add spacing bias (biases the armature against the contact that is connected to pin 4 (D, fig. 6)), Turning the bias adjusting screw outward permits the leaf spring to move the crank in a direction to decrease spacing bias. If turning the bias adjusting screw outward has no effect on the meter reading, friction may be present, preventing movement of the crank by the spring; hand-twist the tension ring (A, fig. 7) clockwise to assist the spring. The final movement of the bias adjusting screw always should be in a clockwise direction to remove residual backlash.

(9) Turn one contact screw slightly away from the armature; the D. C. MILLIAMPERES meter should indicate some bias. Turn the opposite contact screw slowly away from the armature until the approximate zero bias condition ((8) above) is obtained again.

(10) Repeat step (9) above until a 0.004-inch thick paper shim can be inserted easily (but when inserted, is held snugly) between the armature and either of the contacts when the A. C. LINE switch in is the off position.

(11) Restore the A. C. LINE switch to the on position. If the D. C. MILLIAMPERES meter does not indicate exactly zero bias, turn the bias adjusting screw (C, fig. 6) clockwise or counterclockwise as required to obtain a meter indication as close to zero bias as possible.

(12) Perform the manual sensitivity test and, if necessary, the sensitivity adjustment (*b* below).

b. Sensitivity Adjustment.

(1) Insert the relay into the RELAY receptacle of the test set and test the sensitivity of the relay (para 13*b*). If both operate currents are not within the applicable current range (table II above), perform steps (2) and (3) below.

(2) Back off the sensitivity adjusting screw (C, fig. 6) approximately two full turns. The relay operate current values should change as the sensitivity adjusting screw is turned; if they do not change, the relay is defective and should be replaced.

(3) Tap the tension ring lightly (fig. 7) to remove any backlash. Advance the sensitivity adjusting screw slowly until the operate current values are within the applicable current range in table II.

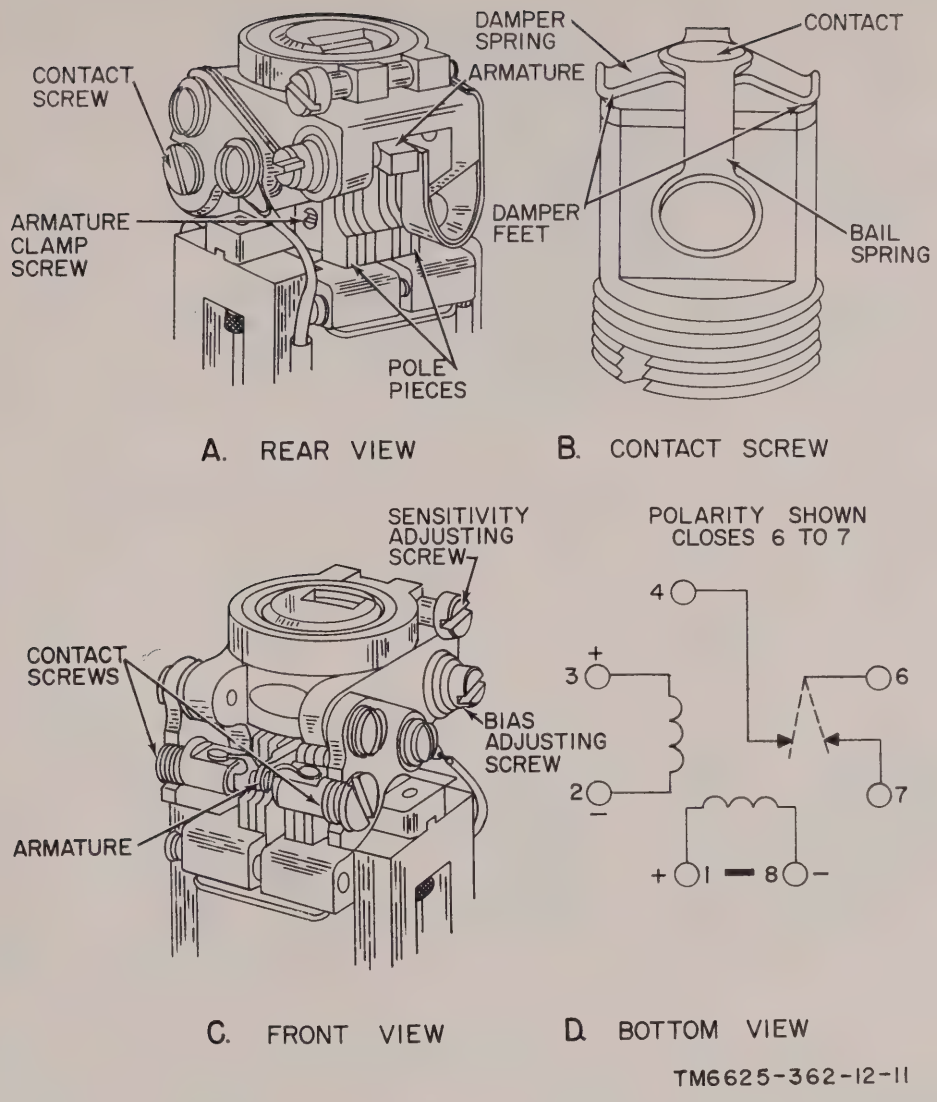


Figure 6. Sigma type 72Z relay, adjustment details.

15. Testing Sigma Type 7Y and 72Y Relays

Sigma type 7Y and 72Y relays are spring spacing contact when the relay coils are not energized). Apply power to the test set (para 12) and test these relays as described below. Complete testing of Sigma type 7Y and 72Y relays includes the bias test, manual sensitivity test, break test, and insulation resistance test (*a* through *d* below). Adjust the Sigma type 72Y relay as described in paragraph 16.

Note. The position of all controls not referenced in the following instructions is immaterial.

a. Bias Test. Because the Sigma type 7Y and 72Y relays include inherent spacing bias which is furnished by the biasing spring, use the test only to determine if the relay is manufactured properly. If the test indicates marking bias under the conditions described below, the relay is faulty and should be replaced.

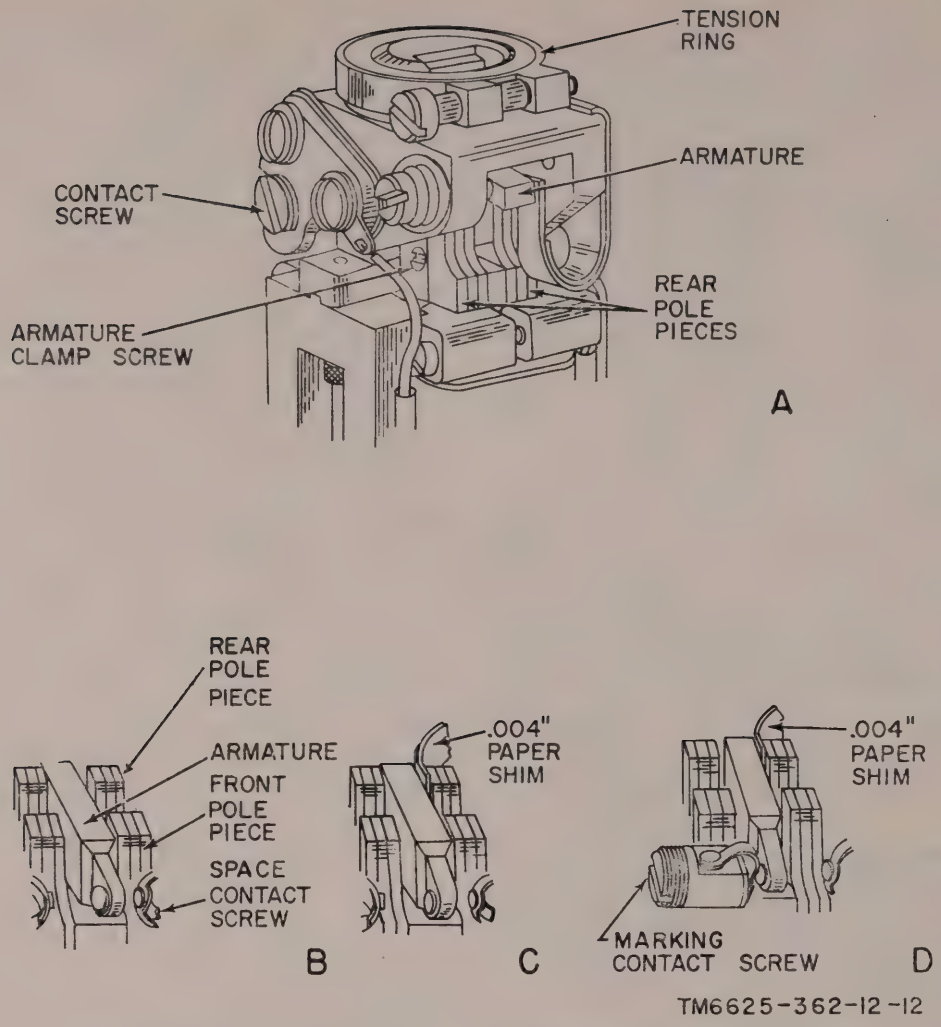


Figure 7. Sigma type 72Z relay, contact preliminary adjustment details.

(1) Set the controls (fig. 5) as follows:

Control	Setting
FUNCTION switch	BIAS.
COILS switch	BOTH.
DRIVE VOLTAGE switch	See table IV below.
A. C. DRIVE knob	Fully counterclockwise.

(2) Plug the relay to be tested into the RELAY receptacle.

(3) Adjust the A. C. DRIVE knob to obtain the A. C. MILLIAMPERES meter reading shown in the *Ac drive current* column of table IV.

(4) The D. C. MILLIAMPERES meter should indicate spacing bias.

b. Sensitivity Test (Manual). Use this test procedure to determine the relay operate current value (minimum current required to move armature from spacing contact to marking contact) and the release current value (maximum current value which can be overcome by force of relay bias spring to move armature from marking contact to spacing contact).

(1) Set the controls (fig. 5) as follows:

Control	Setting
FUNCTION switch	MANUAL.
MANUAL knob	Center of adjustment range.
COILS switch	See table III below.
METER RANGE switch ..	See table III below.

(2) Plug the relay to be tested into the RELAY receptacle; the SPACE indicator should light.

TABLE III. MANUAL SENSITIVITY TEST TABLE (SIGMA TYPE 7Y AND 72Y RELAYS)

Sigma relay type No.	COILS switch position	METER RANGE switch position	Operate current (ma)		Release current (ma)	
			Min	Max	Min	Max
72Y–160BD	BOTH	10	----	16	7	
72Y–400BD	BOTH	10	----	10	4.4	
72Y–1000BD	BOTH	10	----	6.5	2.8	
72Y–2500BD	BOTH	10	----	4	1.75	
72Y–4000BD	BOTH	10	----	3.2	1.4	----
7Y–250B	3–2	10	8.4	----	----	9
7Y–1000B	3–2	10	4.2	----	----	4.5
7Y–5000B	3–2	2.5	1.9	----	----	2.1

(3) Turn the MANUAL knob slowly counterclockwise until the MARK indicator lights and note the position of the D. C. MILLIAMPERES meter pointer; then turn the knob slowly clockwise until the SPACE indicator lights. The *operate current* is the current value indicated by the meter when the MARK indicator lights; the *release current* is shown on the meter when the SPACE indicator lights.

Note. When the COILS switch is set to BOTH (Sigma type 72Y relay), the D. C. MILLIAMPERES meter indicates *one-half* the operate current value of the relay if only one of the relay coils is to be used. For example, if the meter indicates 8 ma, the current value would be 16 ma for relay applications that require the use of only one of the coils.

(4) If the operate and release current values of the Sigma type 72Z relay are not within the tolerances listed in the manual sensitivity test table, perform the adjustments described in paragraph 16.

c. Break Test. The break test procedure for Sigma type 7Y and 72Y relays is similar to the procedure for performing the same test on Sigma type 7Z and 72Z relays (para 13*d*) except as described below.

(1) Set the controls (fig. 5) as follows:

Control	Setting
FUNCTION switch	BREAK.
COILS switch	BOTH.
A.C. DRIVE knob	Fully counterclockwise.
DRIVE VOLTAGE switch.	See table IV below.

TABLE IV. BREAK TEST TABLE (SIGMA TYPE 7Y AND 72Y RELAYS)

Sigma relay type No.	DRIVE VOLTAGE switch position	A. C. MILLIAMPERES meter scale	Ac drive current (ma)
72Y–160BD	LOW	50	20
72Y–400BD	MED.	50	15
72Y–1000BD	MED.	50	9
72Y–2500BD	HIGH	5	5
72Y–4000BD	HIGH	5	4
7Y–250B	LOW	50	16
7Y–1000B	MED.	50	7
7Y–5000B	HIGH	5	3

(2) Plug the relay to be tested into the RELAY receptacle.

(3) Turn the A. C. DRIVE knob clockwise until the A. C. MILLIAMPERES meter indicates approximately the applicable current value listed in the *Ac drive current* column of table IV.

(4) Complete the break test as described in paragraph 13*d*(4) and (5).

d. Insulation Resistance Test. Test the insulation resistance of Sigma type 7Y and 72Y relays as described in paragraph 13*e*.

16. Adjusting Sigma Type 72Y Relays

a. Preliminary Adjustment. Perform the adjustment procedures described in paragraph 14 to prepare the relay for final adjustment. *Before* final adjustment, the relay is identified as a Sigma type 72Z relay (no mechanical bias present). *After* the final adjustments described in *b* below are performed, the relay contains mechanical bias and is identified as a Sigma type 72Y relay.

b. Final Adjustments.

(1) Set the test set controls (fig. 5) as follows:

Control	Setting
FUNCTION switch	MANUAL.
MANUAL knob	Center of adjustment range.
COILS switch	See table III above.
METER RANGE switch....	See table III above.

(2) Turn the MANUAL knob slowly counterclockwise and then clockwise to determine the operate and release current values.

(3) Turn the bias adjusting screw (C, fig. 6) clockwise slowly until the operate and release current values are within the range shown in table III.

(4) Stabilize ("buzz") the relay as follows:

(*a*) Set the FUNCTION switch to BIAS, the COILS switch to 3–2, and the DRIVE VOLTAGE switch to the position shown in table IV.

(*b*) Adjust the A. C. DRIVE knob to obtain the current value shown in table IV. Allow the relay to "buzz" for at least one minute.

(5) Recheck the operate and release currents ((1) and (2) above). If the readings differ from the first readings, repeat steps (2) through (4) until the same current readings are obtained before and after stabilizing and all current readings are within the range shown in table III.

17. Testing and Adjusting Relay RE–163/U

Relay RE–163/U is a magnetic latching relay. (The armature rests against either the marking or spacing contact when neither coil of the relay is energized). Apply power to the test set (para 12) and test the RE–163/U (*a* below); if necessary, adjust the relay (*b* below).

a. Testing Relay RE–163/U. Complete testing of the RE–163/U with this test set includes performing a bias test, sensitivity test, break test, and insulation resistance test ((1) through (4) below). Insert the plug of the adapter cable (fig. 1) into the RELAY receptacle of the test set and test the RE–163/U as follows:

Note. The position of all controls not referenced in the following test instructions is immaterial.

(1) *Bias test.* Use this test procedure to check for bias in the output (contact circuits) of the relay. If the test indicates the presence of bias, adjust the relay as described in *b* below.

(*a*) Set the controls (fig. 5) as follows:

Control	Setting
FUNCTION switch	BIAS.
COILS switch	3–2 or 1–8.
A. C. DRIVE knob	Fully counterclockwise.
DRIVE VOLTAGE switch.	LOW.

(*b*) Plug the relay to be tested into the mating receptacle in the adapter.

(*c*) Turn the A. C. DRIVE knob clockwise until the A. C. MILLIAMPERES meter indicates 15 ma.

(*d*) Note the position of the pointer of the D. C. MILLIAMPERES meter. Multiply the upper scale indication by 10 to determine the percentage of bias. Maximum permissible bias is two percent.

(2) *Sensitivity test.* Use this procedure to determine the minimum current required to move the armature of the relay from each contact to the opposite contact. If the relay does not meet the sensitivity requirement, adjust it as described in *b* below.

(*a*) Set the controls (fig. 5) as follows:

Control	Setting
FUNCTION switch	MANUAL.
MANUAL knob	Fully counterclockwise.
COILS switch	1–8.
METER RANGE switch	2.5.

(*b*) Plug the relay to be tested into the mating receptacle of the adapter. The MARK indicator should light; this indicates that the armature is against the marking contact.

(*c*) Turn the MANUAL knob clockwise slowly. Note the current value indicated by the D. C. MILLIAMPERES meter the instant the SPACE indicator lights. This current value is the current required to move the armature to the spacing contact.

(*d*) Turn the MANUAL knob counterclockwise slowly and note the current value indicated by the D. C. MILLIAMPERES meter the instant the MARK indicator lights. This current value is the current required to move the armature to the marking contact.

(*e*) Set the COILS switch to the 3–2 position and repeat the procedure given in (*c*) and (*d*) above.

(*f*) The current values noted during the above tests should be between 0.4 and 1.6 ma.

(3) *Break test.* Use this test procedure to determine the *sum* of the two transfer times of the relay (total time the armature is in transit from one contact to the opposite contact) during one full input signal cycle. This sum of the two transfer times is indicated by the test set as a percentage of the total time of one input signal cycle. Contact efficiency (total time the armature is against the relay contacts during one full input signal cycle) is determined by subtracting the break percentage from 100. If the break percentage exceeds twenty percent, adjust the relay (*b*) below.

(*a*) Set the controls (fig. 5) as follows:

Control	Setting
FUNCTION switch	BREAK.
COILS switch	3–2 or 1–8.
A. C. DRIVE knob	Fully counterclockwise.
DRIVE VOLTAGE switch.	LOW.

(*b*) Plug the relay to be tested into the mating receptacle of the adapter.

(*c*) Turn the A. C. DRIVE knob clockwise until the A. C. MILLIAMPERES meter indicates 15 ma.

(*d*) Hold the TEST switch in the downward position. The pointer of the D. C. MILLIAMPERES meter should move to the right full-scale position. If it does not deflect full scale, turn the ADJUST control to obtain full-scale deflection. If full-scale deflection is not possible, set the ADJUST control to obtain a reading within one division of full-scale deflection.

(*e*) Release the TEST switch and note the position of the D. C. MILLIAMPERES meter pointer. Multiply the top-scale indication of the meter by ten to obtain the break percentage. The break percentage should not exceed twenty percent.

(4) *Insulation resistance test.* Plug the relay into the mating receptacle in the adapter and follow the test procedure described in paragraph 13*e* to determine whether the insulation resistance of the relay is sufficient (at least 1 megohm).

b. Adjusting Relay RE–163/U.

(1) *Preparation.*

(*a*) Insert the plug of the adapter cable (fig. 1) into the RELAY receptacle of the test set. Insert the relay into the mating receptacle of the adapter.

(*b*) Remove the relay cover, loosen the two knurled tension nuts (fig. 8), and turn the pole piece screws away from the armature as far as possible.

(*c*) Turn both contact screws several turns away from the armature.

(2) *Armature alignment.* The contact screws should be aligned with the center of the contact disks on the armature of the relay (when viewed from both front and top). If not aligned, loosen the armature clamping screws slightly, position the armature to obtain proper alignment, and tighten the clamping screws.

(3) *Contact screws adjustment.*

(*a*) Set the FUNCTION switch to MANUAL, the DRIVE VOLTAGE switch to EXT, and the A. C. LINE switch to the on (lower) position.

(*b*) Turn the right-hand contact screw slowly toward the armature until the MARK indicator lights; then turn the contact screw in the opposite direction (away from the armature) one-third the distance between adjacent holes in the contact screw.

(*c*) Repeat the above procedure with the left-hand contact screw (SPACE indicator will light).

(*d*) Hold the armature lightly against one contact screw and check the gap between the opposite contact screw and the adjacent contact surface of the armature. The gap should be within .003 to .005 inch. Repeat (*b*) and (*c*) above if the gap is not correct.

(4) *Pole piece screws adjustment.*

(*a*) Turn the right-hand pole piece screw until it is near the armature, tighten its associated knurled tension nut finger tight, and continue to advance the pole piece screw until it moves the armature against the left-hand contact screw (SPACE indicator will light). Back off the right-hand pole piece screw one-quarter to one-half turn.

(*b*) Turn the left-hand pole piece screw until it is near the armature and tighten its associated knurled tension nut finger tight.

(*c*) Set the test set controls for the bias test (*a*(1) above) and advance or retract the left-hand pole piece screw until the D. C. MILLIAMPERES meter pointer vibrates at zero.

(*d*) Test the sensitivity of the relay (*a*(2) above). If it does not meet the sensitivity requirements, refine adjustment of the pole piece screws to obtain the proper sensitivity. Tighten the knurled tension nuts tightly and recheck for bias and sensitivity (*a*(1) and (2)).

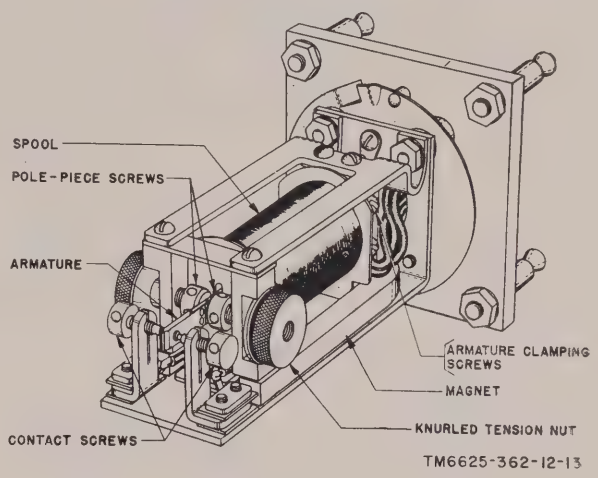


Figure 8. Relay RE-163/U, cover removed.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

18. Scope of Maintenance

First and second echelon maintenance of the test set is performed by the test set user. This maintenance includes:

a. Preventive maintenance (para 19).

b. Operational check (para 20).

c. Organizational troubleshooting (para 20).

d. Replacement of organizational maintenance parts (para 21).

Note. No tools or test equipment is issued specifically for first or second echelon maintenance of this test set. This maintenance is accomplished with the tools and test equipment authorized the user for maintenance of the relay-using equipment.

19. Preventive Maintenance

a. DA Form 11–266. DA Form 11–266 (fig. 9 and 10) is a preventive maintenance checklist to be used. Items not applicable to the test set are lined out in figure 10. References in the ITEM block of figure 10 indicate the paragraphs that contain additional maintenance information pertinent to the particular item. Instructions for use of the form appear on the form.

b. Items. The information shown in this subparagraph supplements DA Form 11–266. The item numbers correspond to the ITEM numbers on the form.

Item	Maintenance procedures
1	Use a clean cloth to remove dust, dirt, moisture, and grease from the case assembly and the front panel. If necessary, wet the cloth with Cleaning Compound (Federal stock No. 7930–395–9542) and then wipe the parts with a dry, clean cloth.
3	All control knobs should work smoothly, be tight on the shafts, and should not bind. Tighten all loose knobs and be sure that the knobs do not rub against the panel.
5	Repair any cuts in the power cable assemblies by covering them with rubber tape and then with friction tape.
10	Use cleaning compound to remove dirt, then dry with a clean cloth.

***Warning:* Cleaning compound is flammable and its fumes toxic. Do not use it near a flame; provide adequate ventilation.**

20. Operational Checklist

a. Use the checklist to check the operation of the test set. If the test set does not operate properly, use the suggested corrective measures to correct the trouble. If none of the corrective measures corrects the fault, higher echelon maintenance is required.

b. Perform the checks in the sequence listed below.

Action	Normal indication	Corrective measures
Set A.C. LINE switch to on (lower) position.	Pilot indicator (fig. 5) lights.	Check to be sure that cable assembly plugs are inserted fully into receptacles. Check fuse F1 (fig. 2); replace if defective (para 21). Check to be sure that power is available at power source receptacle. Check lamp DS1 (fig. 2 and 11); replace if defective (para 21). Check for continuity across pins 3 and 7 of voltage regulator tube V1 (fig. 2 and 11); replace if continuity is not present (para 21).
Plug relay known to be in good condition into appropriate test set receptacle. Set FUNCTION switch to MANUAL, set MANUAL knob fully counterclockwise	MARK indicator should light.	Check MARK indicator lamp DS3 (fig. 2); replace if defective (para 21).
Turn MANUAL knob clockwise.	SPACE indicator should light.	Check SPACE indicator lamp DS4 (fig. 2); replace if defective (para 21).
Set FUNCTION switch to BREAK; DRIVE VOLTAGE and COILS switches to correct position (para 13*d*, 15*c*, or 17*c*); set A.C. DRIVE knob for correct ac drive current, and hold TEST switch down.	Full-scale deflection to right of D.C. MILLIAMPERES meter should be possible by adjustment of ADJUST control.	Replace voltage regulator tube V1 (fig. 2, para 21*a*). If no change in indication occurs, install original tube V1 and replace rectifier tube V2. If trouble persists, higher echelon maintenance is required; install original tube V2.

Note. When the A.C. LINE switch is in the lower position, voltage regulator tube V1 should glow brightly.

21. Replacement of Organizational Maintenance Parts

Maintenance parts authorized for replacement at organizational level are listed in *a* below. Refer to *b* through *e* below for instructions on replacement of those parts having a replacement procedure that is not obvious.

a. Organizational Maintenance Parts.

(1) Fuse F1 (fig. 2; *b* below).
(2) Fuseholder cap (11, fig. 11; *b* below).
(3) Indicator lens (3, 5, 7, and 12, fig. 11; *c* below).
(4) Indicator lamp DS1, DS2, DS3, and DS4 (fig. 2 and 11; *c* below).
(5) Voltage regulator tube V1 (*d* below).
(6) Rectifier tube V2 (*e* below).
(7) Tube shield (16, fig. 11).
(8) Tube retainer (17, fig. 11).
(9) Knobs 1, 4, 8, 13, 14, and 15 (fig. 11).
(10) Cable assembly (fig. 1 and 2).
(11) Thumbscrew (9, fig. 11).
(12) Latch (6, fig. 11).
(13) Catch (20, fig. 11).
(14) Bumper (9, fig. 11).

b. Replacement of Fuse and Fuseholder Cap.

(1) Press the fuseholder cap (fig. 11) inward, turn it counterclockwise slightly, and remove the cap and fuse from the fuseholder.

MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT
TEST EQUIPMENT
(AR 750-625)

EQUIPMENT NOMENCLATURE

TEST SET, RELAY TS-1194A/U

EQUIPMENT SERIAL NUMBER

123

INSTRUCTIONS

This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue.

1. For detailed Preventive Maintenance instructions see:
   a. The Technical Manual *(in TM 11 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   b. The Supply Bulletin *(SB 11-100 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   c. The Department of the Army Lubrication Order. *(See DA Pamphlet Number 310-4)*

2. The following action will be taken by either the Communications Officer/ Chief for 1st echelon, or the Inspector for higher echelon
   a. Enter Equipment Nomenclature and Serial Number.
   b. Strike out items that do not apply to the equipment.

3. Operator/Inspector will enter in the columns entitled CONDITION, on the proper line, a notation regarding the condition, using symbols specified under LEGEND.

4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor.

FOLD

TYPE OF INSPECTION

OPER-ATOR	2/3 ECH-ELON	DATE	SIGNATURE
✓	✓	4 JULY 1960	Sgt. John Jones

U. S. GOVERNMENT PRINTING OFFICE 1957 O—427138

4

DA FORM 1 MAY 57 11-266

TM6625-362-12-8

Figure 9. DA Form 11-266, pages 1 and 4.

LEGEND for marking conditions:
Satisfactory, ✓.
Adjustment, Repair or Replacement required, X.
Defect corrected, (X).

DAILY CONDITION FOR MONTH OF JULY 1960

NO.	DAILY ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2D ~~3D~~ ECHELON
1.	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF ~~HOUSINGS~~, CASES, ~~CABINETS~~, CONTROL PANELS, INTERCONNECTING PLUGS, CABLES, ~~HEADSETS~~, METER WINDOWS, ETC. PARA 19																	✓	✓	✓	✓												✓
2.	INSPECT FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS SWITCHES, KNOBS, JACKS, CONNECTORS AND PILOT LIGHTS.																	✓	✓	✓	✓												✓
3.	INSPECT CONTROLS FOR BINDING, SCRAPING. TAP CONTROLS LIGHTLY FOR CUT-OUT DUE TO LOOSE CONTACTS. PARA 19																	✓	✓	✓	✓												✓
4.	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION.																	✓	✓	✓	✓												✓

	WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D ~~3D~~ ECH
5.	INSPECT CORDS, CABLES, WIRE AND SHOCK MOUNTS FOR BREAKS, CUTS, KINKS, DETERIORATION, STRAIN AND FRAYING. PARA 19	✓					✓
6.	~~INSPECT CANVAS AND LEATHER ITEMS FOR FUNGUS, FRAYING, TEARS, BROKEN ZIPPERS AND SNAP FASTENERS.~~						
7.	HAND CHECK FOR LOOSENESS OF EXTERIOR ITEMS SUCH AS HANDLES, LATCHES, HINGES.	✓					✓
8.	~~INSPECT FOR LUBRICATION IN ACCORDANCE WITH APPLICABLE DA LUBRICATION ORDER.~~						
9.	~~INSPECT DRY BATTERIES FOR DIRT, LOOSE TERMINALS AND LEAKAGE.~~						
10.	INSPECT EXPOSED METAL SURFACES FOR RUST AND CORROSION. PARA 19	✓					✓
11.	INSPECT METERS FOR DAMAGED GLASS AND CASES.	✓					✓

	ADDITIONAL ITEMS FOR 2D ~~AND 3D~~ ECHELON INSPECTIONS	CONDITION
12.	INSPECT SEATING OF READILY ACCESSIBLE ITEMS OF A PLUCK-OUT NATURE: ~~CRYSTALS~~, FUSES, CONNECTORS, ~~PLUG-IN COILS~~, LAMPS, ETC. DO NOT REMOVE, ROCK OR TWIST TO INSPECT. USE ONLY A DIRECT PRESSURE TO INSURE THE ITEM IS FULLY SEATED.	✓
13.	~~INSPECT FOR CLEANLINESS AND TIGHTNESS OF SUCH ITEMS AS SHOCK MOUNTS, ANTENNA, ANTENNA MOUNTS AND WAVE GUIDES.~~	
14.	~~INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR DIRT, CORROSION, WORN OR BURNED CONTACTS.~~	

	ADDITIONAL ITEMS FOR 2D ~~AND 3D~~ ECHELON INSPECTIONS	CONDITION
15.	~~INSPECT RESISTORS, BUSHINGS, INSULATORS FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE.~~	
16.	INSPECT JACKS AND CONNECTORS FOR SNUG FIT AND GOOD CONTACTS.	✓
17.	~~INSPECT VARIABLE CAPACITORS FOR DIRT AND MOISTURE.~~	
18.	~~INSPECT AIR FILTERS FOR CLEANLINESS.~~	
19.	~~INSPECT SCREWTYPE TERMINALS OF TRANSFORMERS, FIXED CAPACITORS, RESISTORS, CHOKES, POTENTIOMETERS AND RHEOSTATS FOR CORROSION, DIRT AND LOOSE CONTACTS.~~	
20.	~~CLEAN AND TIGHTEN SWITCHES, BLOWERS, RELAY CASES; CLEAN INTERIOR OF CHASSIS AND CABINETS.~~	
21.	~~INSPECT GENERATORS, MOTORS AND DYNAMOTORS FOR BRUSH WEAR, SPRING TENSION, ARCING AND COMMUTATOR WEAR.~~	
22.	~~INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS.~~	
23.	~~INSPECT GASKETS AND BUSHINGS FOR WEAR AND DAMAGE.~~	
24.	~~INSPECT CATHODE RAY TUBES FOR BURNED SCREEN SPOTS.~~	
25.	~~BEFORE STORING OR SHIPPING REMOVE ALL BATTERIES.~~	

IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. *(Continue on page 4, if more space is needed)*

2 3

TM6625-362-12-9

Figure 10. DA Form 11-266, pages 2 and 3.

(2) Install a new fuse in the fuseholder cap, insert the fuse and cap in the fuseholder, press the cap inward, and turn it clockwise slightly to lock it in place.

c. Replacement of Indicator Lens and Indicator Lamp.

(1) Turn the indicator lens (fig. 11) counterclockwise to remove it from the lampholder.

(2) Press the lamp inward, turn it counterclockwise slightly, and pull it from the lampholder.

(3) Insert the new lamp in the lampholder, press it inward, and turn it clockwise to lock it in place.

Note. Indicator lamps DS1, DS3, and DS4 (fig. 2) are incandescent lamps which include a clearly visible filament. Indicator lamp DS2 is a neon lamp which contains two elements with a space between them. Insert only the neon lamp (DS2) into the LEAK indicator lampholder (fig. 5). Indicator lamps DS1, DS3, and DS4 are identical and are interchangeable.

(4) Insert the indicator lens in the lampholder and turn the lens clockwise until it is fully seated.

d. Replacement of Voltage Regulator Tube VI.

(1) If the test set chassis is housed in its case, remove the four thumbscrews (two on each side of the test set panel), remove the chassis from the case, and disconnect plug P3 (fig. 3) from its receptacle on the rear panel of the chassis.

(2) Unhook the springs of the tube retainer (17, fig. 11), remove the tube retainer, and pull the voltage regulator tube straight outward from its socket.

Caution: **Do not rock a tube when removing it from its socket; rocking may damage the tube pins.**

(3) Plug the new tube into its socket and replace the tube retainer.

(4) If the test set is to be used as a portable test set, insert plug P3 (fig. 3) into the receptacle on the rear panel of the test set chassis, insert the chassis into the case, and secure it in place with the four thumbscrews.

e. Replacement of Rectifier Tube V2.

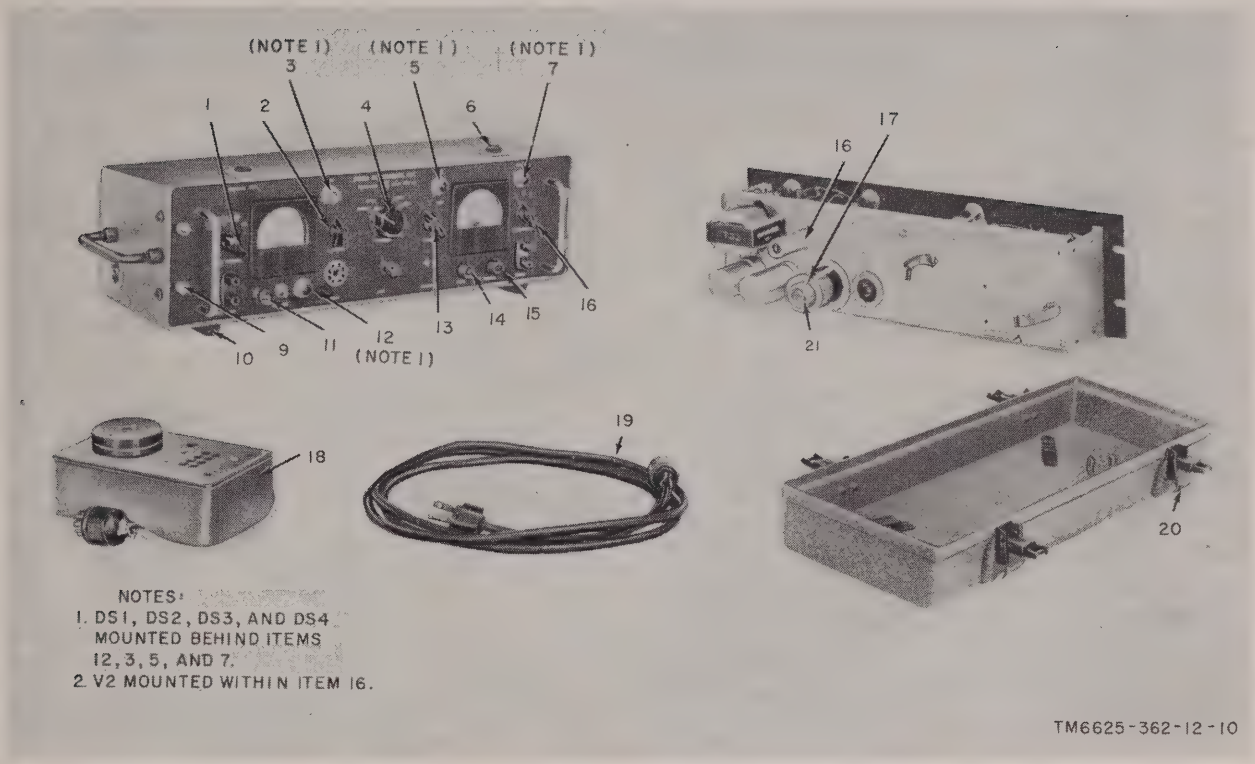
(1) Perform the procedure given in *d*(1) above, if applicable.

(2) Remove the tube shield (16, fig. 11) from the chassis.

(3) Pull the rectifier tube V2 (fig. 2 and 11) straight outward from its socket. (Observe the caution in *d*(2) above.)

(4) Insert the new recifier tube into its socket and replace the tube shield.

(5) Perform the procedure in *d*(4) above, if applicable.



1 Knob (DRIVE VOLTAGE switch)
2 Knob (A.C. DRIVE switch)
3 Lens, clear (LEAK indicator)
4 Knob (FUNCTION switch)
5 Lens, green (MARK indicator)
6 Catch
7 Lens, amber (SPACE indicator)
8 Knob (METER RANGE switch)
9 Thumbscrew
10 Bumper, rubber
11 Fuseholder cap
12 Lens, red (pilot indicator)
13 Knob (COILS switch)
14 Knob (AUTO control)
15 Knob (MANUAL control)
16 Tube shield. (Shields rectifier tube V2)
17 Tube retainer. (Retains voltage regulator tube V1)
18 Adapter cable assembly
19 External cable assembly
20 Latch
21 Voltage regulator tube V1 (OA3/VR75)

Figure 11. Location of organizational maintenance parts.

CHAPTER 4

MATERIEL USED IN CONJUNCTION WITH TEST SET, RELAY TS–1194A/U

22. Oscilloscope AN/USM–50A

Oscilloscope AN/USM–50A (or equal) may be used to obtain a waveform indication of the output signals of the relay under test when performing the bias and break tests (para 13*a* and *d*, 15*a* and *c*, and 17*a* and *c*). Refer to TM 11–5129 for detailed instructions for operation of the AN/USM–50A.

23. Use of Oscilloscope During Bias Test

Use an oscilloscope to view bias test signals as follows:

a. Connect the oscilloscope to the SCOPE terminals (fig. 5) of the test set. The lower terminal is ground.

b. Adjust the oscilloscope as described in its operating instructions manual. The signal available for the oscilloscope is approximately 45 volts peak to peak.

c. Perform the bias test as described in paragraph 13, 15, or 17, as applicable. The waveform of the relay output signals should appear as shown in figure 12. The references used in figures 12 and 13 indicate the following:

Reference	Indication
T	Time required for one complete output cycle of relay under test.
t_m	Time relay armature rests against marking contact.
t_s	Time relay armature rests against spacing contact.
t_{sm}	Time required for relay armature to move from spacing contact to marking contact.
t_{ms}	Time required for relay armature to move from marking contact to spacing contact.

d. Bias is indicated by the relative lengths of t_m and t_s as follows:

(1) When the relay output signals contain no bias, t_m and t_s will be equal in length.

(2) When t_m is longer than t_s, marking bias is present. (The D.C. MILLIAMPERES meter pointer should rest at some point on the left side of the meter scale.)

(3) When t_s is longer than t_m, spacing bias is present and the D.C. MILLIEMPERES meter pointer should rest at a point on the right side of the meter scale.

e. If contact bounce is present, it will appear as breaks in t_m and t_s.

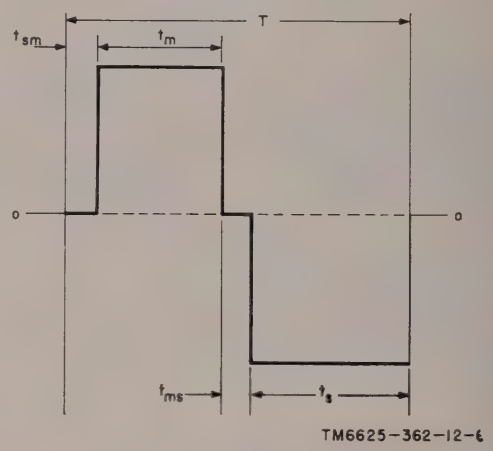


Figure 12. Bias test waveform.

24. Use of Oscilloscope During Break Test

Use an oscilloscope to view break test signals as follows:

a. Connect the oscilloscope to the SCOPE terminals (fig. 5) of the test set. The lower terminal is ground.

b. Adjust the oscilloscope as described in its operating instructions manual. The signal available for the oscilloscope is approximately 22 volts peak to peak.

c. Perform the break test as described in paragraph 13, 15, or 17, as applicable. The waveform should appear as shown in figure 12. See paragraph 23*c* for the significance of the reference indications in figure 13.

d. The sum of t_{sm} and t_{ms} is equal to the total armature transfer time of the relay under test.

e. Contact bounce is indicated by a spike (sharp rise) to the right of t_{sm} or t_{ms}.

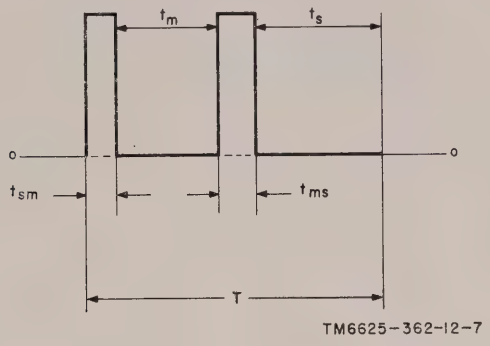


Figure 13. Break test waveform.

CHAPTER 5

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

25. Preparation for Repacking

Prepare the test set for repacking as follows:

a. Main Components.

(1) Disconnect both ends of the external cable assembly (fig. 1). Secure the female plug of the cable assembly into the clip in the cover, coil the cable around the spring retainers, and tape the male plug to the coiled cable.

(2) Check to be sure that the four thumbscrews (two on each side of test set panel) are tightened securely.

(3) Set the cover in place on the case and fasten the four latches.

b. Adapter.

(1) Tape several thicknesses of any suitable protective padding (corrugated fiberboard, cloth, etc) around the plug of the adapter cable assembly.

(2) Wind the adapter cable assembly around the adapter and tape it securely in place.

c. Spare Parts.

(1) Tape several thicknesses of any suitable protective padding (*b*(1) above) around each of the spare parts.

(2) Assemble the separately wrapped fuses, wrap the assemble fuses with additional padding, and tape them together to form a single package.

d. Technical Manuals. Insert the technical manuals in a waterproof bag and seal the bag watertight.

26. Repacking for Shipment or Limited Storage

The exact procedure for repacking the test set depends on the materials available and the condition under which the test set is to be shipped or stored. If suitable corrugated fiberboard cartons are available, package the main components, adapter, spare parts, and technical manuals as described in paragraph 7 and seal the outer carton with pressure-sensitive tape.

Section II. DEMOLITION TO PREVENT ENEMY USE

27. Authority for Demolition

Demolish the test set only upon the order of the commander. Use the destruction procedures described in paragraph 28 to prevent further use of the test set.

28. Methods of Destruction

a. Smash. Smash the controls, meters, adapter, switches, tubes, panel, case, cover, plugs, and receptacles; use sledges, hammers, crowbars, pickaxes, or other suitable tools.

c. Burn. Burn the cable assemblies, technical manuals, and transformers; use gasoline, fuel oil, or incendiary grenades.

d. Dispose. Bury or scatter the destroyed parts in trenches or foxholes, or throw them into nearby streams.

APPENDIX I

REFERENCES

The following manual is applicable to operation of the test set when Oscilloscope AN/USM–50A, -50B, or –50C is used as an auxiliary equipment:

TM 11–5129	Oscilloscopes AN/USM–50A, B, and C.

APPENDIX II

MAINTENANCE ALLOCATION

1. Scope

This appendix assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon. It also lists the tool and test equipment authorized for each echelon of maintenance.

2. Maintenance Allocation Chart Columns

a. Part or Component. This column shows only the nomenclature or standard item name for each maintenance part or component. Additional descriptive data is included only where clarification is necessary to identify the part. Components and parts comprising a major end item are listed alphabetically. Assemblies and subassemblies of major end items are in alphabetical sequence with their components listed alphabetically immediately below the assembly listing. Mounting hardware, such as screws, bolts, nuts, washers, clamps, and brackets is not included in the list.

b. Maintenance Function. Column 2 indicates the various maintenance functions that will be performed for each part or component listed in column 1.

(1) *Service.* To clean and to preserve.

(2) *Inspect.* To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.

(3) *Test.* To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.

(4) *Replace.* To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

(5) *Repair.* To restore to a serviceable condition by replacing unserviceable parts or by any other action required utilizing tools, equipment, and skills available to include welding, grinding, riveting, straightening, adjusting, etc.

(6) *Calibrate.* To determine, check or rectify the graduation of an instrument.

(7) *Rebuild.* To restore to a condition comparable to new by disassembling the item to determine the condition of its component parts and reassembling it using serviceable, rebuilt, or new assemblies, subassemblies, and parts.

c. 1st, 2d, 3d, 4th, 5th Echelon. The symbol "X" in column 3 indicates the lowest echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked are authorized to perform the indicated operation also.

d. Tools Required. The numbers in column 8 indicate tool and test equipments required to perform the related maintenance function. These numbers are identified in the allocation of tools for maintenance functions chart (para 4).

e. Remarks. Column 9 contains any notations when necessary to clarify data in the preceding columns.

3. Maintenance by Using Organizations

When this equipment is used by signal service organizations organic to theater headquarters or a communications zone to provide theater communications, those maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment.

4. Allocation of Tools for Maintenance Functions Columns

a. Tools Required for Maintenance Functions. Column 1 lists the tool and test equipments required to perform the maintenance functions.

b. 1st, 2d, 3d, 4th, and 5th Echelon. A dagger (†) in column 3, 5, or 6 indicates that the tool or test equipment is allocated to that echelon.

c. Tool Code. The numbers in column 7 are code numbers assigned to the associated tool or test equipment and are used in the maintenance allocation chart to refer to the indicated item.

d. Remarks. Column 8 is not used.

Maintenance Allocation Chart

(1) PART OR COMPONENT	(2) MAINTENANCE FUNCTION	(3) 1ST ECH.	(4) 2ND ECH.	(5) 3RD ECH.	(6) 4TH ECH.	(7) 5TH ECH	(8) TOOLS REQUIRED	(9) REMARKS
TEST SET, RELAY TS-1194/U	service	X	X		X		1,5	
	inspect	X	X					
	test				X	X	1,2,3,4	
	repair		X				5	
	calibrate				X	X	1,3,4	
	rebuild					X	4	
ADAPTER RELAY	replace		X					
	repair				X			
BUMPER, RUBBER	replace		X					
CASE, ADAPTER, RELAY	replace					X		Process locally
CONNECTOR, RECEPTACLE, ELECTRICAL	replace				X			
COVER, ADAPTER, RELAY	replace				X			
GROMMET, RUBBER	replace				X			
CABLE ASSEMBLY, POWER, ELECTRICAL	repair				X			
CABLE, POWER, ELECTRICAL	replace				X			
CONNECTOR, PLUGS, ELECTRICAL	replace				X			
CASE, TEST SET	repair					X		Fabricate if required
BRACKET ASSEMBLY	replace					X		Fabricate if required
BUMPER, RUBBER	replace		X					
CABLE ASSEMBLY	replace		X					
	repair				X			
CABLE	replace				X			
CONNECTOR, PLUG, ELECTRICAL	replace				X			
CATCH, LUGGAGE	replace		X					
CONNECTOR, RECEPTACLE, ELECTRICAL	replace				X			
COVER, TEST SET	replace				X			
	repair				X			
CLIP, SPRING	replace				X			
LATCH, LUGGAGE	replace		X					
HANDLE	replace				X			
TEST SET, RELAY (SIGMA NO. 1503)	repair		X					
BINDING POSTS	replace				X			
BRACKET ASSEMBLIES	replace					X		Fabricate if required
CAPACITORS	replace				X			
CHASSIS ASSEMBLY	replace					X		Fabricate if required
CLAMPS, PLASTIC	replace				X			Fabricate if required

Maintenance Allocation Chart—continued

(1) PART OR COMPONENT	(2) MAINTENANCE FUNCTION	(3) 1ST ECH.	(4) 2ND ECH	(5) 3RD ECH.	(6) 4TH ECH.	(7) 5TH ECH	(8) TOOLS REQUIRED	(9) REMARKS
TS-1194/U (continued)								
CLAMP, SPRING TENSION	replace				X			
ELECTRON TUBES	replace		X					
FRONT PANEL	replace					X		Fabricate if required
FUSEHOLDERS	replace				X			
CAPS, FUSEHOLDERS	replace		X					
FUSES	replace		X					
HANDLE	replace				X			Fabricate if required
KNOBS	replace		X					
LIGHT, INDICATOR	replace				X			
LAMPS	replace		X					
LENS, INDICATOR LIGHT	replace		X					
MILLAMETER	replace				X			
MOUNITNG CLIPS, RESISTOR	replace				X			Fabricate if required
MOUNTING, SOCKET, ELECTRON TUBE	replace					X		Procure locally
RESISTORS	replace				X			
RETAINER, ELECTRON TUBE	replace		X					
RETAINER, ELECTRON TUBE SOCKET	replace				X			
RETAINING RING, ELECTRON TUBE SOCKET	replace				X			
SHIELD, ELECTRON TUBE	replace		X					
SOCKETS, ELECTRON TUBE	replace				X			
SPRINGS	replace		X					
SWITCH, ROTARY	replace				X			
SWITCH, TOGGLE	replace				X			
TERMINAL BOARDS	replace				X			Fabricate if required
THUMBSCREWS	replace		X					
TRANSFORMERS	replace				X			
WIRING HARNESS	replace				X			Fabricate if required

Allocation of Tools for Maintenance Functions

(1) TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	(2) 1ST ECH.	(3) 2ND ECH.	(4) 3RD ECH.	(5) 4TH ECH.	(6) 5TH ECH.	(7) TOOL CODE	(8) REMARKS
TS-1194/U (continued)							
METER TEST SET TS-682/GSM-1				†	†	1	
MULTIMETER AN/URM-105				†	†	2	
OSCILLOSCOPE AN/USM-50				†	†	3	
TEST SET, ELECTRON TUBE TV-2/U					†	4	
TEST SET, ELECTRON TUBE TV-7/U				†		4	
TOOL EQUIPMENT TK-21/G				†	†	4	
TOOLS AND TEST EQUIPMENT NORMALLY AVAILABLE TO THE REPAIRMAN USER BECAUSE OF HIS ASSIGNED MISSION		†				5	

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NG: State AG (3).

USAR: None.

For explanation of abbreviations used, see AR 320–50.

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